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ABSTRACT

The Joint First-Stage Achievement Test (JFAT) is a new unified college entrance examination developed in Japan. This report presents the statistical results of the JFAT and the applicants' behavior change which appeared through the first six years of administration from 1979 to 1984. Three major features of the JFAT are described: (1) jointly made achievement test; (2) comprehensive examination; and (3) open scoring system. The expected and unexpected outcomes of these three major features are presented. The jointly made achievement test has improved the quality of test items. Psychometrically, there is difficulty in controlling test statistics: (1) test items are discarded and created yearly; and (2) neither equating operations nor scale transformation procedures are currently in use. The comprehensive examination was designed to encourage high school students to study a broad curriculum, but the opposite occurred. Many students elected to enroll in private universities that require examinations in few subjects, thus avoiding the more difficult study that a broad curriculum implies. An open scoring system guaranteed fair and objective scoring and was thought to be helpful in making students' career plans. However, pre-admission rankings based on disclosed JFAT scores caused homogeneous self-selection to and rank ordering of universities. (Author/PN)

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On the Present Status of the Joint First-Stage Achievement Test (JFAT) for Selecting University Entrants in Japan

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and

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At NCME Annual Meeting

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Abstract

The Joint First-Stage Achievement Test (JFAT) is a new unified college entrance examination test in Japan. This report gives the statistical results of the JFAT and the applicants' behavior change which appeared through the first six years' administration from 1979 to 1984.

Three major features of the JFAT : 1) jointly made achievement test, 2) comprehensive examination, and 3) open scoring system are explained. Their expected and unexpected outcomes are disscussed.

The jointly made achievement test have improved test items, although test constructers suffer from the difficulty of controlling test statistics.

Comprehensive examination aimed to encourage high school students broad curriculum study, but the students narrow their studies and incline their mind to private universities which require a small number of subjects.

Open scoring system was welcomed at first for the objective fairness of scoring and was thought to be helpful in making students' career plan, but it results to strengthen the self-selection to university on the basis of the JFAT scores.

This is a good example to see how important the social environment is to success for a large scale testing system.

1. Introduction

The Joint First-Stage Achievement Test (JFAT hereafter) is a unified college entrance examination test which is jointly administered on the same days by all national and local public universities in Japan. As every applicant who wants to enter a local public or national university has to take the JFAT, all high school students, their parents, their teachers, and university professors are greatly concerened about this test. A great number of debates is occurred around this test every year. The author would like to introduce some of the present status of this test.

Japan administered two large scale unified tests comparable to the JFAT in the past. The one was administered after the World War II and the other in the late 60's, but both failed to continue after several years' trials for various reasons.

Under a completely new and different policy, the National Center for Universtiy Entrance Examination (NCUEE) was inaugurated in 1977 and the first joint achievement test was administered in 1979 under this organization's management. This was the greatest reform of the Japanese university entrance examination system of this decade. I have participated in NCUEE's work as a guest professor since it began.

This report is not, however, a technical psychometric report on a test. Rather, it is a comment on the trends that have appeared in the applicants' behavior after the JFAT was introduced.

What has occurred as a result of the introduction of the JFAT is a good example the importance of the social environment to the success of a large scale testing system. It is truly an interactive product between test takers and people who need it. Our eight years' experience makes clear that some of the initial intentions of this test were realized, but it also makes clear that some unexpected things happened too. I want to talk about these consequences today.

Unfortunately, I can use here only limited number of resources, these

are the official reports from NCUEE. We lack statistical data on private universities and much of the national data are confidential until the authorized committee decides to release them to the public. I attached, in Appendix, a list of research monographs that the NCUEE has published. More detailed data can be found in these original monographs. Those who are interested may request them directly from the Center or from the author of the paper.

2. The System of University Students Admission

Before explaining the Joint First-Stage Achievement Test (JFAT), I will briefly explain our university entrance examination system.

Japan's universities may be divided into two groups:(1) national and local public universities and (2) private universities. High school students may apply for either or both groups of universities. The national and the local public universities (including one special private medical university after 1982) number 130 this year. The JFAT is applied only to applicants for this group of universities.

Private universities constitute the larger groups: There are over 330 of them in Japan. Each college and/or department of a university makes own entrance examination independently from other private university and these examinations are offered on different days (mostly during February after the JFAT was given). Students can apply to as many private colleges and universities as they wish, as long as are able to take the examinations. Each private university independently determines its own admissions.

Figure 1 illustrates the process by which students apply for and are admitted to a particular university.

Fig. 1

The JFAT is administered once a year on the same days and same time in January before private universities' examinations begin. It is administered at over 290 locations throughout country. Students decide to which university to apply on the basis of the JFAT scores, although they have to tentitatively declare themselves the name of university which they want to enter before they take the JFAT, but it can be changed when they take the Second-Stage Examinations. With few exceptions, students are permitted to apply to no more than one national or local public university.

The examination subjects of the JFAT are summarized in Table 1.

Table 1

Each national and local public university, then, gives those applying to it its own entrance test. These are called the Second-Stage Examination Test. The Second-Stage Examination Test is administered by most of all universities on the same day after the majority of private university's examinations are over. The final admission decision is made by combining both the JFAT scores and the Second-Stage Examination Test scores.

Each student, then, can apply to one public (national or local) university and or to several private universities. If an applicant is admitted to more than one university, the applicant has a choice, but the applicant is admitted to no university, the applicant waits, studies more, and tries again next year. Quite a few applicants apply in two or more years.

3. Expected and Unexpected Results of the System

A) Data on the JFAT examination

Table 2-4 indicate the statistics of the JFAT from 1979 to 1984. They include:

1) The number of examinees (Table 2)

2) The means of total and subtest scores (Table 3)

3) The standard deviations of total and subtest scores (Table 4)

Table 2 - 4

The 1985 data are deleted because the examination system was changed a little bit, making them non commparable with the previous years' data. The eighth administration completed this January, and the data are not yet available.

B) Overview of expected and unexpected results

From its inception no other test causes as great a controversy in our society as the JFAT. Table 5 summarizes the features of the JFAT system, the outcome expected from that feature, and the undesirable outcomes that have occurred.

Table 5

Below I discuss these expected and unexpected outcomes.

C) Jointly made achievement test

One important success of the jointly made achievement test is that good quality test items have been written. The test items are constructed over approximately a two year period. The draft items are prepared and discussed by a group of subject-matter experts selected from the professors in national universities (high school teachers are not included). Consequently, good quality test items have been created and the test

content has been generally welcomed by most high-school teachers.

Each national university no longer suffers from the lack of so sufficient number of subject-matter experts for writing test items as was the case in the past before the introduction of the JFAT system. University faculty say that the staff members of a single university would never be able to make better test than the JFAT. Test item improvement is, perhaps, the greatest merit of this system.

From psychometric points of view, however, there exists some obvious problems. Strict equivalence of the means and the standard deviations among subtest scores are not maintained from year to year, as can be seen in Table 3 and 4. Principal factor analysis of covariances among subject areas indicates there is too much loading in mathematics and too little in Japanese language and other subjects (Ikeda, H., University Entrance Examination Forum, No.2, 1983). Thus, Mathematics has a heavier weight than Japanese language and other subjects in the total composite score.

The lack of subtest equivalence within a subject (see Table 1. e.g., social studies or science) often results in complaints about unfairness from those examinees who took a difficult subtest as their option. The mean differences among subtests, however, are due partly to test difficulties and partly to the ability of students who took the subtest.

Using the analysis of variance method, Shimizu (NCUEE Research Bulletin , No. 6, 1983), a staff member of the National Center for University Entrance Examinations, compared the amount of variance associated with subtest difficulty with the amount of variance associated with the ability of students who took the subtest. In social studies, the mean square due to subtest difficulty is much greater than that due to student ability, but in science, the source of variation due to subtest difficulty has been decreased in recent years by the test constructors' careful attention in writing test items (Table 6). Currently, major difference among means of science subjects represents the difference of students' abilities. Test constructors in social studies should pay more

attention to this fact as those in science do when writing test items.

Table 6

To write test items having the same statistical characteristics is quite a difficult task. New test items are written every year. The same item is never reused, no matter how good the item was. No communication, except for team leaders, is permitted among persons writing items for the different subtests, in order to keep the item contents confidential until the examination is over. Item writers create items by reviewing previously used items, the item analysis results, and use their own experiences. Currently, there are no equating operation or scale transformation procedure being used because we have not yet attained a consensus of doing so in test committee.

D) Comprehensive examination

The second major expected outcome of the JFAT was that its use would encourage high school students to study curriculums in more areas because JFAT is comprehensive, covering many subjects. But the opposite has occurred. The reason lies with the admission policies of the private universities.

Most private universities require for admission examinations in only a small number of major subjects, such as Japanese language, English, and one optional subject (usually either Mathematics or one of the Social Studies). As a result, a good number of high school students tend to give up their persuit of a place in a national university early in their high school years and thereby avoid the difficult study that a broad curriculum implies. They concentrate their study on a small number of subjects which major private universities require, and neglect to study

non-required subjects. This threats the normal study of high school curriculum. This was an unexpected resultant when the new system was initiated. Table 7, 8 and 9 gives support to this hypothesis. Table 7 indicates a gradual decrease in proportion of high school graduates who take the JFAT.

Table 7

Table 8 indicates a gradual increase in the number of applicants who chose not to take the Second-Stage Entrance Examination, even though they took the JFAT test. It is said that many excellent students moved to private universities and this means a decline of the prestige of national universities.

Table 8

Similar change of pattern of choice is found in the number of applicants who took the optional curriculums in social studies. The number of applicants who took the combination of "Ethics" and "Poli. Sci. & Economics" constantly increased from 1979 to 1981, while the combination of "Japanese History" and "World History" decreased considerably (Table 9). The former combination is easy to study and the latter is difficult even though both subjects are related each other, because histories require learning a great number of facts.

From1982, a policy was implemented which no longer permitted candidates from taking both "Ethics" and "Poli. Sci. & Economics". This was done to prevent further increases in the number avoiding more difficult to learn subjects (The combination of Geology A and B was not permitted

from the beginning).

Table 9

E) Open scoring system:

The third major improvement by the JFAT was considered to be the open scoring system. The JFAT is a completely objective test and the day after administration, all the questions and the correct answers are opened to the public through mass media. So the applicants can calculate their number right score by themselves.

At first, this was welcomed by most people because it guaranteed a fair and objective scoring and it was thought to be helpful to applicants who have to decide to which university to apply.

However, the advantages soon becomes a drawback. Using a comuputer, one can make a prediction, with fairly high probability of being correct, whether a particular student, should he/she apply to such and such university with a certain JFAT score would be accepted. Just after the JFAT is administered, education industry collects from nearly all examinees within a short period of times self-scored tests and the names of the universities to which they want to apply. This information is obtained before the deadline for submitting the university application. The education industry calculates each individual's success probability by comparing his/her self-reported score with the competiors' scores who want to go to the same university and returns this information to each individual before the deadline for submitting the university application. Upon receiving this information, each candidate realizes how difficult or easy it is to enter the university he/she has chosen. Thus, even before the Second-Stage Examination is held, candidates can predict their own success, with high accuracy, because the First and the Second Examination

Tests are highly correlated.

Table 10

A measure of the extent to which there are shifts in the universities' applicant pool is the "competitive rate" defined as the ratio of the number of applicants to the number of admissions. Table 10 shows the competitive rate before and after the JFAT given. The average of the competitive rate among national universities is decreased and leveled after the JFAT was given. The percentage of applicants who changed university to which they applied has also increased.

If a particular applicant had a high JFAT score, then the applicant would change his/her application, and take the Second-Stage Examination for higher ranked and more prestigeous university, regardless of his/her academic interest. When his/her score is not high enough to enter the aspired university, he/she gives up and does not apply to the national universities.. Table 8 is also a give-up indication for entering national universities.

As a result of this phenomenon, national universities are rank ordered in terms of entrance difficulty along the line of the average applicants' JFAT scores. In other words, the JFAT contributes to form a national standard of high-school student ability. Consequently, about the same level of applicants in terms of JFAT scores come to apply for the same university. Journalists have named this the "Wagiri" or "slice" phenomenon.

Shimizu (University Entrance Examination Forum, No. 5, 1985) analyzed the ratio of the standard deviation of average scores between university departments to the standard deviation of the JFAT scores within the same university department in which the competition is made. The results are

shown in Table 11. Both SDs are about the same magnitude.

Table 11

Does the data support the "Wagiri" phenomenon? In other words, is "within SD_W" too small compared with "between SD_B"? Expert views differ. There is an opinion that a great variation in student abilities had already existed among universities before the new system was introduced. Therefore, so-called the slice effect is not a result of this new system. We found the ratios of the first three years are small and the last three years are large. This is not an evidence of "Wagiri", but it should be a reflection of policy change of selecting options in social studies from 1982 as stated in the bottom of Page 7, because the average standard deviations whithin the same universitiy departments (SD_W) do not have an obvious decreasing trend throughout years.

But some university faculties express their belief that the abilities of students in their classes now are less variable than those in the past. They say students with homogeneous ability may be easier to teach but the classes lack vitality and freshness.

4. Final Words

I have reviewed some of the behavior changes of university applicants that appeared after the JFAT system was introduced. The JFAT is the largest social experiment that Japanese education system has ever undertaken. After its eight year trial, this testing system stands at a turning point. High school curriculum was changed in 1985 and the first high school graduates who studied under the new curriculum will have to

take the JFAT next year. The JFAT of 1987 will have a drastic change in both the examination contents and the way of procedure.

The number of subtests a candidate is required to take will be reduced from seven to five in order to dissolve the complaints from high school students and teachers who say that the seven is too much to study. Psychometrically I am afraid that it will reduce the reliability of the JFAT scores.

The applicants will have to definitely decide the university to apply before the JFAT is taken. They cannot change the univerisity to apply after getting information from education industry's prediction based on the JFAT scores. This would reply for the institution's demand which wants greater variety of student's abilities. The candidates, however, may submit the application form up to two national universities. The candidates may have a choice if they are admitted by the two universities.

Such a large scale testing system as the JFAT is always performed, to some extent, under some compromise among complaints from various sources. No matter how psychometrically good the test is, the test may be rejected from other reason. The success or failure of a testing system depends upon the social circumstances in which the test is used. High school students, teachers, parents, universities professors, as well as psychometricians have different views upon the system.

What kinds of behavior change will be seen in applicants are of great interest to us. Although the prediction is difficult at this moment, the past eight years' experience has taught our psychometic technicians the importance of social views under which the testing system is operating.

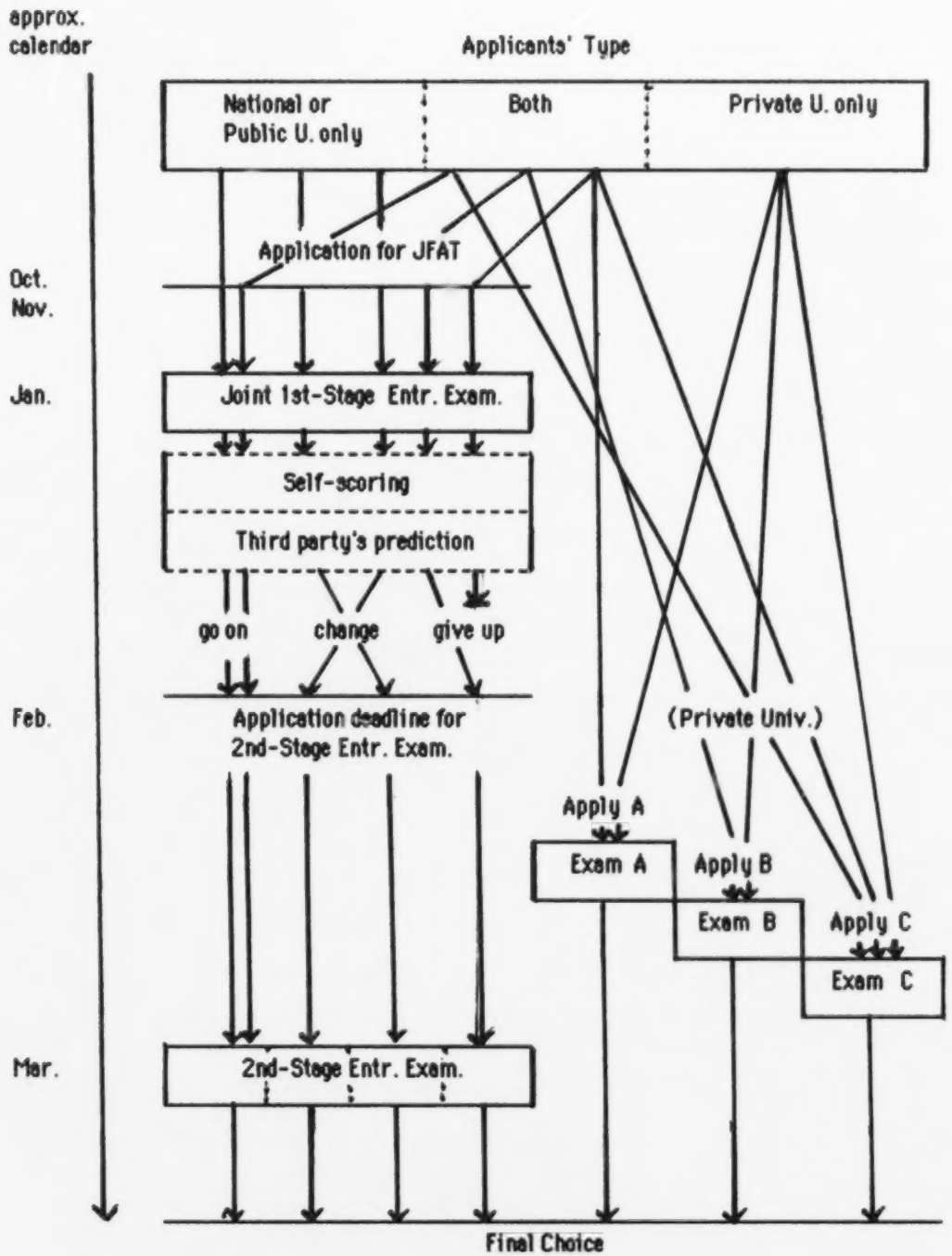

Fig. 1: Application and Determination Process of University Entrants
(System will be changed after 1987)

Table 1: Subject Areas and Subtests of the JFAT from 1979 to 1984*

Subject area	Subtests	Subjects to be selected
Japanese Language	Japanese Language	Required to all examinees
Social Studies	Ethics Poli. Sci. & Economics Japanese History World History Geography A Geography B	Two subtests are selected, but selecting both Geography A and B is not permitted. Selection both Ethics and Poli. Sci. & Economics was not permitted after 1982.
Mathematics	Mathematics I General Math.	General Mathematics may be taken by applicants who did not take Mathematics I in high school.
Sciences	Physics I Chemistry I Biology I Geology I Fundamental Science	Fundamental Science may be taken by applicants who did not take any of the other four science subject courses in high school.
Foreign Languages	English B German French English A	English A may be taken by applicants who did not take English B course in high school. English A is more elementary than B.

* The subtest constitution was changed in 1985.

Table 2: The Number of Examinees Taking the Joint First-Stage Achievement Test

Exam Subjects	1979	1980	1981	1982	1983	1984
All subjects	327,140	333,026	340,614	334,118	343,049	341,288
Japanese Language	326,550	332,935	340,506	334,028	342,942	341,288
Social Sudies						
Ethics	72,350	120,039	165,668	134,737	175,969	217,743
Poli. Sci. & Economics	142,710	178,394	242,053	171,761	137,586	88,062
Japanese History	192,039	155,368	117,116	152,116	153,563	152,157
World History	159,531	128,729	88,633	98,654	102,679	105,658
Geography A	51,714	47,451	32,491	57,646	62,351	64,747
Geography B	35,494	35,925	35,169	53,212	53,845	54,117
Mathematics						
Math. I	326,477	332,766	340,317	333,852	342,762	341,270
General Math.	54	28	18	22	17	18
Sciences						
Physics I	184,568	178,844	164,844	142,728	152,358	164,913
Chemistry I	265,323	259,056	256,613	239,397	255,557	270,457
Biology I	153,742	163,090	180,421	187,294	185,698	174,151
Geology I	49,822	64,582	78,943	98,527	92,193	72,821
Fundamental Science	159	107	115	92	85	87
Foreign Language						
English B	321,893	328,538	336,362	330,422	339,652	338,278
German	303	331	424	346	305	281
French	192	222	234	235	177	208
English A	4,031	3,467	3,222	2,734	2,582	2,153

[Source: National Center for University Entrance Examination, Statistics in University Entrance Examination Forum, No. 3, 1984]

Table 3: The Means of Subtest Scores of the Joint First-Stage Achievement Test

Exam Subjects	1979	1980	1981	1982	1983	1984
All Subjects (Total Score)*	636.07	617.36	607.12	620.00	636.10	608.77
Japanese Language	66.11	69.39	66.45	67.48	64.98	61.80
Social Sudies (Average of Two)	(57.87)	(60.31)	(63.98)	(57.63)	(59.74)	(63.23)
Ethics	61.83	61.29	71.88	62.19	63.26	67.89
Poli. Sci. & Economics	58.09	73.42	60.64	50.20	52.19	55.30
Japanese History	54.01	51.92	62.10	56.18	59.23	63.67
World History	57.21	53.73	61.04	62.83	61.75	59.48
Geography A	65.62	52.63	62.81	61.08	62.98	61.12
Geography B	62.18	62.08	64.73	60.96	61.58	66.11
Mathematics	(75.81)	(73.19)	(61.67)	(60.45)	(69.63)	(54.15)
Math. I	75.96	73.25	61.72	60.50	69.69	54.16
General Math.	29.82	25.63	18.83	32.27	35.44	30.83
Sciences (Average of Two)	(56.02)	(58.93)	(57.88)	(66.90)	(64.42)	(68.46)
Physics I	59.87	55.17	51.20	66.09	66.67	69.39
Chemistry I	50.58	56.82	56.64	69.49	68.99	70.73
Biology I	60.96	65.33	63.36	65.45	60.57	63.93
Geology I	56.12	61.93	63.55	64.68	55.96	68.91
Fundamental Science	32.47	31.11	36.81	36.18	38.33	47.28
Foreign Language	(62.35)	(46.90)	(53.59)	(57.54)	(59.28)	(56.73)
English B	62.75	47.09	53.82	57.76	59.48	56.88
German	60.97	56.28	51.03	52.44	54.33	56.90
French	58.33	51.30	56.23	56.45	64.20	53.96
English A	42.27	33.34	35.83	40.00	40.50	42.35

[Source: National Center for University Entrance Examination, Statistics in University Entrance Examination Forum, No. 3, 1984.]

* The perfect total score is 1000. Each perfect subtest score is 100.

Total score is calculated by (Japanese language)x2 + (Sum of two social studies) + (One mathematics)x2 + (Sum of two sciences) + (One foreign language)x2

Table 4: The Standard Deviations of Subtest Scores on the Joint First-Stage Achievement Test

Exam Subjects	1979	1980	1981	1982	1983	1984
All Subjects (Total Score)*	134.28	128.11	138.32	136.92	142.27	146.64
Japanese Language	12.03	12.42	12.61	13.62	12.65	13.62
Social Sudies (Average of Two)	(13.74)	(13.85)	(13.00)	(14.43)	(14.80)	(14.52)
Ethics	15.52	15.95	14.95	17.45	15.41	16.37
Poli. Sci. & Economics	13.47	13.33	11.75	11.28	12.96	11.48
Japanese History	14.81	15.60	14.53	15.50	17.09	16.76
World History	16.91	14.26	17.63	19.48	19.03	17.55
Geography A	13.67	11.73	13.62	15.41	14.61	14.54
Geography B	15.59	16.50	17.90	16.84	17.57	18.42
Mathematics	(22.17)	(23.62)	(25.88)	(22.55)	(24.65)	(26.11)
Math. I	21.94	23.55	25.82	22.50	24.58	26.11
General Math.	16.12	16.14	10.48	18.70	21.45	21.96
Sciences (Average of Two)	(19.76)	(14.95)	(17.31)	(16.07)	(18.35)	(17.79)
Physics I	24.62	19.27	17.94	22.85	20.67	23.65
Chemistry I	21.89	14.41	18.97	15.76	19.53	19.01
Biology I	19.76	17.54	20.48	15.33	19.10	16.11
Geology I	18.55	17.46	19.57	17.43	16.38	16.16
Fundamental Science	12.39	11.26	14.30	11.71	11.57	12.02
Foreign Language	(15.85)	(16.80)	(17.62)	(18.63)	(17.51)	(17.83)
English B	15.41	16.66	17.44	18.47	17.34	17.68
German	22.04	24.06	24.00	22.63	24.96	24.87
French	21.33	23.61	27.71	28.67	26.49	28.32
English A	16.04	15.47	17.26	16.96	15.20	18.56

* The perfect total score is 1000. Each perfect subtest score is 100.

Total score is calculated by (Japanese language)x2 + (Sum of two social studies) + (One mathematics)x2 + (Sum of two sciences) + (One foreign language)x2

Table 5 : Expected and Unexpected Outcomes of the JFAT System

Features of the JFAT system	Expected outcomes	Unexpected outcomes
1) Jointly made achivement test	Test item improvement	Difficulty in controlling test statistics
2) Comprehensive examination	Overall curriculum study	Students narrow their studies
3) Open scoring system	Objective fairness and helping career plan	Self-selection to universities on the basis of JFAT scores

Table 6 : The Ratios of Mean Square between Subtest Variation to Mean Square within Subtest Variation for the JFAT

Year	(1) Social Studies	(2) Sciences
	MS_B/MS_W	MS_B/MS_W
1979	7.01	2.27
1980	51.99	3.65
1981	15.85	4.87
1982	7.80	0.80
1983	7.75	0.42
1984	10.61	0.80

[Adapted from Simizu, T., NCUEE Research Bulletin, No. 6, 1983, and personal communication]

Table 7 : The Proportion of High-School Graduates
Who Apply to Take the JFAT

Year	(1) The number of JFAT applicants*	(2) The number of high-school graduates	(3) = (2)/(1)
1979	229×10^3	138×10^4	.166
1980	224×10^3	140×10^4	.160
1981	230×10^3	142×10^4	.162
1982	229×10^3	145×10^4	.158
1983	236×10^3	152×10^4	.155
1984	229×10^3	148×10^4	.155

[Adapted from Statistics in University Entrance Examination Forum, No. 5, 1985.]

* Excluded the applicants who graduated more than one year ago.

Table 8 : The Give-up Ratios in the Second-Stage Examination

Year	Give-up Ratio*
1979	.122
1980	.167
1981	.210
1982	.209
1983	.209
1984	.228

[Adapted from Statistics in University Entrance Examination Forum, No. 6, 1985]

* Give-up Ratio = 1 - (The number of applicants who took the Second-Stage Examination)/(The number of applicants who took the JFAT)

Table 9 : Selection Pattern of Subjects in Social Studies
(Percentage of Applicants Who Selected)

	Ethics		Poli. Sci. & Economics		Japanese History		World Histroy		Geography A
Poli. Sci. & Economics	8.9 17.2 32.2	- - -							
Japanese History	6.7 8.6 7.7	17.4 21.7 26.2	17.8 16.7 17.7	22.3 17.0 11.1					
World History	4.9 7.0 6.2	11.7 15.1 18.7	10.6 11.2 11.3	12.5 9.5 6.1	24.4 13.6 5.0	2.9 2.8 3.1			
Geography A	0.8 1.4 1.1	5.5 7.4 10.2	3.7 4.6 5.0	8.9 7.7 4.9	6.0 4.5 2.0	1.6 1.8 2.3	5.3 3.8 1.5	1.2 1.3 1.5	
Geography B	0.7 1.3 1.4	5.8 7.1 8.7	2.6 3.3 4.9	7.7 5.9 3.7	3.9 3.2 2.0	1.3 1.5 1.9	3.6 3.0 2.0	1.2 1.2 1.6	not permitted to take both

[Source: Statistics in University Entrance Examination Forum, No. 3, 1984]

Each cell entry corresponds to the year of

1979	1982
1980	1983
1981	1984

Table 10: Competitive Rates and Application Change
Before and After JFAT Score is Known

Year		Competitive Rates*			Application Change	
		National Univ.	Public Univ.	Total	Same Univ.	Shifted Univ.
1979	Before JFAT**	3.6	4.7	3.7		
	After JFAT***	3.0	5.0	3.2	59.5%	40.5%
1980	Before JFAT	3.6	4.2	3.7		
	After JFAT	2.9	4.5	3.1	56.8%	43.2%
1981	Before JFAT	3.7	4.1	3.7		
	After JFAT	2.8	4.6	3.0	55.7%	44.3%
1982	Before JFAT	3.6	4.1	3.7		
	After JFAT	2.7	4.6	2.9	54.5%	45.5%
1983	Before JFAT	3.7	4.4	3.8		
	After JFAT	2.8	4.4	3.0	53.8%	46.2%
1984	Before JFAT	3.6	4.4	3.7		
	After JFAT	2.8	4.2	2.9	44.7%	55.2%

[Adapted from Statistics in University Entrance Examination Forum, No. 5, 1985]

* Competitive Rate
= (The number of applicants)/(The number of admissions)

** Based on the number of applicants who took the JFAT. The applicants have to tentitatively state the name of university which they wish to go. Their JFAT scores are not yet known.

*** Based on the number of applicants who took the Second-Stage Examinations. Their own JFAT scores are already known.

Table 11: Ratios of the Standard Deviations of the JFAT Scores Between to Within Universities

Year	(1) SD of average scores between universities (SD_B)	(2) Pooled SD within universities (SD_W)	(3) Ratio of (1)/(2) (SD_B/SD_W)
1979	82.73	94.17	.879
1980	75.53	89.47	.844
1981	83.40	93.81	.889
1982	88.32	89.09	.991
1983	87.54	89.78	.975
1984	92.93	94.53	.983

[Source: Simizu, T., University Entrance Examination Forum, No.5, 1985]

$$(1)\quad SD_B = \sqrt{\frac{\sum_g n_g(\bar{x}_g - \bar{x}_T)^2}{g-1}} \qquad (2)\quad SD_W = \sqrt{\frac{\sum_g \sum_i (x_{ig} - \bar{x}_g)^2}{n-g}}$$

where $n = \sum_g n_g$, $\quad x_T = \frac{1}{n}\sum_g \sum_i x_{ig}$

Appendix: List of NCUEE Research Bulletins **

No. 1.* Watanabe, H. (1981) A Bayesian conditional analysis of structural test scores. pp. 15.

No. 2. Nakajima, N. (1982) A case study concerning two groups of students: One admitted by recommendation and the other by the second examination of a college. pp. 27.

No. 3. Ikeda, T. (1982) A case study on the differences in the mastery level and retention level of high school subjects between students admitted by recommendation and by examinations. pp. 16.

No. 4. Watanabe, H. (1983) Comparisons of regression techniques for the prediction of test scores from small samples. pp. 17.

No. 5. Nakajima, N. (1983) Character and content of ACT assessment program. pp. 45.

No. 6. Simizu, T. (1983) A statistical analysis of the differences between subjects in social studies and natural science of the Joint Achievement Test. pp. 31.

No. 7. Suzuki, N. (1984) On the relationship between the scores of applicants in the Joint Achievement Test and their applications for universitites. pp. 25.

No. 8. Yamada, F. (1984) Selection ratios of branches and their changes in the subject of natural science on the Joint Achievement Test. pp. 40.

No. 9. Ikeda, T. & Nakajima, N. (1984) The change and its characteristics of entrance subjects at national and local public universities and colleges: 1978 to 1979 academic year. pp.34.

No. 10. Watanabe, H., Ikeda, T., Otsuka, Y., Suzuki, N. & Yamada, F. (1984) Constructing scales for the subjects of Japanese Language, Mathematics I, and English B on the Joint First Stage Achievement Test in the 1982 academic year. pp. 167.

No. 11. Ikeda, H. (1985) A table of the confidence region of the true scores in multiple-choice test estimated by the random guessing model. pp. 40.

No. 12. Iwatsubo, S. (1985) The evaluation of differences between two test-questions for the Joint First-Stage Achievement Test and the supplementary examination by means of the test scores from monitors. pp. 43.

No. 13. Hidano, T. (1985) A study on entrance requirements of courses -Subjects tested at university entrance examinations- pp.98.

As another offical publication, "University Examination Forum", from No. 1 (1983) to No. 7 (1985) are also available.

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* Monogran No. 1 was written in English. The rest of others were written in Japanese with English abstracts.

** Monographs may be obtained by writing to The National Center for University Entrance Examination, 19-23, Komaba 2-Chome, Meguro-Ku, Tokyo 153, Japan.